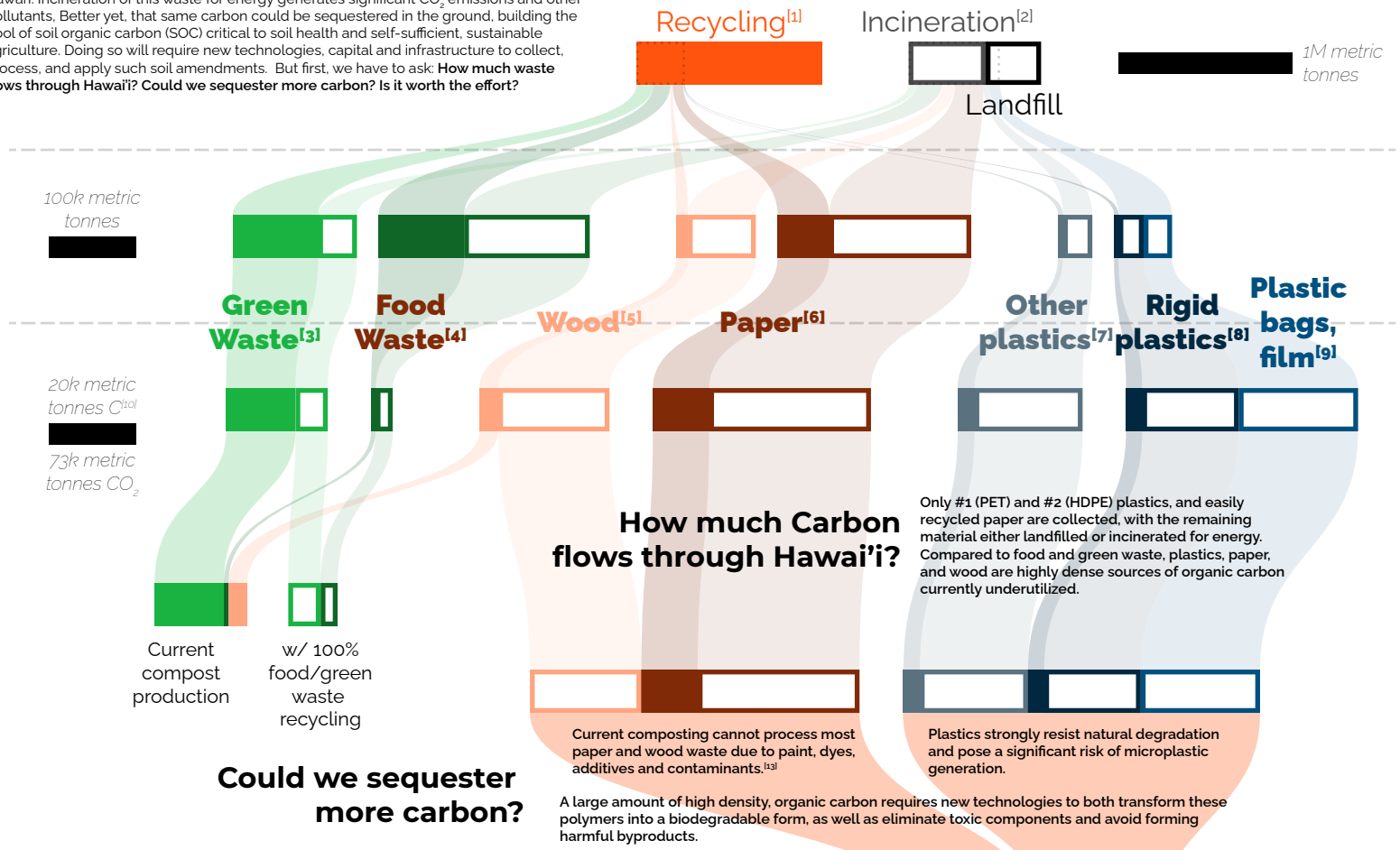


# Trash-to-Soil: The Flow of Waste and Carbon in Hawai'i

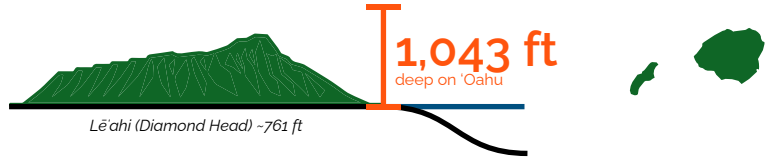
The carbon embedded in everyday waste presents both a problem and a solution in Hawai'i. Incineration of this waste for energy generates significant CO<sub>2</sub> emissions and other pollutants. Better yet, that same carbon could be sequestered in the ground, building the pool of soil organic carbon (SOC) critical to soil health and self-sufficient, sustainable agriculture. Doing so will require new technologies, capital and infrastructure to collect, process, and apply such soil amendments. But first, we have to ask: **How much waste flows through Hawai'i? Could we sequester more carbon? Is it worth the effort?**

## Annual Solid Waste Flows on 'Oahu



### Could we sequester more carbon?

If that waste was dumped on 'Oahu beaches, within a lifetime it would reach<sup>[11]</sup>:

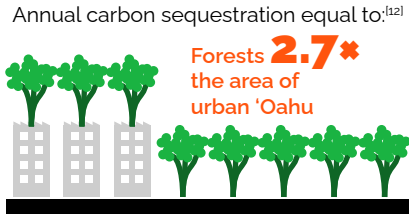


### Is it worth it?

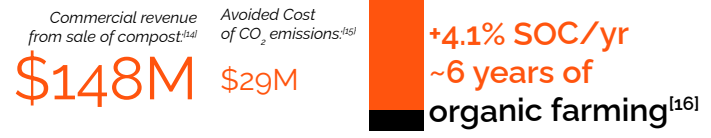
If we could transform all this waste into soil organic carbon, what environmental, social, and economic benefits would it bring to Hawai'i?

#### Notes and References

- [1] Rates taken for 2017 from the City & County of Honolulu Department of Environmental Services "Recycling and Landfill Diversion"  
[https://www.opala.org/solid\\_waste/archive/facts2.html](https://www.opala.org/solid_waste/archive/facts2.html)
- [2] Cascadia Consulting Group, "2017 Waste Composition Study Final Report."  
[https://www.opala.org/solid\\_waste/pdfs/2017%20Waste%20Composition%20Study.pdf](https://www.opala.org/solid_waste/pdfs/2017%20Waste%20Composition%20Study.pdf)
- [3] Recycling Categories: Green Waste  
Landfill/Incineration Categories: Green Waste, Stumps
- [4] Recycling Categories: Food Waste  
Landfill/Incineration Categories: Food Waste-Vegetative, Food Waste-Non-Vegetative
- [5] Recycling Categories: Wood Waste/Pallets  
Landfill/Incineration Categories: Untreated Wood, Treated Wood, Pallets
- [6] Recycling Categories: Corrugated Cardboard, Newspaper Office Paper, Other Paper  
Landfill/Incineration Categories: Uncoated Corrugated Cardboard, Newspaper, Paper Bags, White and Colored Ledger Paper, Mixed Recyclable Paper, Compostable Paper, Other Paper
- [7] Recycling Categories: Tires  
Landfill/Incineration Categories: Expanded Polystyrene, Other Plastic, Textiles, Carpet
- [8] Recycling Categories: Plastic  
Landfill/Incineration Categories: HI-5 Plastic PET Containers, Non-HI-5 Plastic PET Containers, HI-5 Plastic HDPE Containers, Non-HI-5 Plastic HDPE Containers, Other Bottles/Containers, Mixed Rigid/Durable Plastics
- [9] Landfill/Incineration Categories: Plastic Bags, Other Plastic Film/Wrap
- [10] Material conversion factors were based on the Environmental Protection Agency's (EPA) "Documentation for Greenhouse Gas Emission and Energy Factors Used in the Waste Reduction Model (WARM)"  
<https://www.epa.gov/warm/documentation-chapters-greenhouse-gas-emission-energy-and-economic-factors-used-waste-reduction/>
- [11] The volume of avoided waste was calculated based on density conversion factors for "Trash bags of waste recycled instead of landfilled."  
<https://www.epa.gov/energy/greenhouse-gases-equivalencies-calculator-calculations-and-references>  
The area of 'Oahu beaches was calculated for the "Unconsolidated Shore" category from the 2010 National Oceanic and Atmospheric Administration (NOAA) Coastal Change Analysis Program (CCAP) for Hawaii and the US Territories.  
<https://coast.noaa.gov/digitalcoast/data/ccapregional.html/>
- [12] The CO<sub>2</sub> fixation rate equivalent in forests was calculated based on the Net Primary Production fixation rates for "Native mesic-wet forest," Selman, P.C., Gardina, C.P., Jacobi, J.D., Zhu, Zhilang, eds. "Baseline and projected future carbon storage and carbon fluxes in ecosystems of Hawai'i" US Geological Survey Professional Paper 1834, 134 pp., doi: 10.3133/pp1834  
The area of 'Oahu urban land was taken from "Urban and Rural Areas in the State of Hawai'i, by County, 2010"  
[https://files.hawaii.gov/dbedt/census/Census\\_2010/Other/2010urban\\_rural\\_report.pdf](https://files.hawaii.gov/dbedt/census/Census_2010/Other/2010urban_rural_report.pdf)
- [13] The area of active 'Oahu farmland was taken from the "2020 Update to Hawai'i Statewide Agricultural Land Use Baseline"  
<https://hdoa.hawaii.gov/salub2020/>
- [14] Revenue estimates were made assuming \$1/kg C as compost, comparable to the price of compost from Hawaiian Earth Recycling  
<https://hawaiianearth.com/compost-soil-prices>  
A bulk density of 500 kg/m<sup>3</sup> and 10% drymass C was assumed in accordance with similar compost material properties.  
<https://blackearthcompost.com/compost/>
- [15] The cost of CO<sub>2</sub> emissions was based on a social cost of carbon (SCC) of \$51/ton CO<sub>2</sub>  
<https://www.washingtonpost.com/climate-environment/2021/02/26/biden-cost-climate-change/>
- [16] Percent SOC increases were calculated from the 0-30 cm layer of soil, assuming a bulk densit of 1.33 g/cm<sup>3</sup>. An equivalent number of years of organic farming was based on an average difference in net rate of carbon sequestration between organic and conventional farming of 0.45 Mg C/ha/yr.  
Gattinger, A. et al. "Enhanced top soil carbon stocks under organic farming" Proceedings of the National Academy of Science of the U.S.A., 2012, 109(46): 18226-18231, doi: 10.1073/pnas.1209429109
- [17] To obtain a statewide estimate of values for 'Oahu were normalized by its population and multiplied by the state-wide population from 2019 Census estimates.  
<https://www.census.gov/quickfacts/fact/table/hi.honolulucountyhawaii/P5T045219/>



Carbon added to existing 'Oahu farmland:<sup>[13]</sup>



Implementing state-wide would generate:<sup>[17]</sup>

